

Remarks

Claims 16 - 32 are pending.

The present invention is directed to cement additives which have properties similar to casein, a natural protein which is widely used in cements as a dispersant, or "plasticizer." Casein has numerous advantages over synthetic polymers: it is widely available at relatively low cost, and provides excellent rheological characteristics. Unfortunately, being a natural protein, it is subject to attack by microorganisms, which can cause discoloring growth on cement structures. Thus, where visible surfaces are present, synthetic polymer dispersants have been used. Unfortunately, while microorganism growth is much reduced or eliminated, the rheological characteristics have not been as good as casein. It was the object of the invention to provide a synthetic polymer which has all the benefits of casein without its disadvantages.

Applicants surprisingly and unexpectedly achieved this object by copolymer dispersants which require at least one monomer from each of four categories of monomers. Reference may be had to claim 16 for describing each of these monomer groups. Of importance in the present discussion are monomer groups c) and d). Monomer c) is an ethylenically unsaturated polyoxyethylene glycol or ether thereof, while monomer d) is an ethylenically unsaturated polyoxypropylene or polyoxybutylene glycol or ether thereof.

Claims 16 - 23, 25, and 27 - 29 have been rejected as unpatentable over Kinoshita EP 1 090 901 ("*Kinoshita*") under 35 U.S.C. § 103(a). Applicants respectfully traverse this rejection.

Kinoshita discloses a new, solventless method of synthesis of unsaturated polyetherester monomers by neat reaction in the presence of certain polymerization inhibitors. The reaction is an acid-catalyzed esterification of a polyoxyethylene glycol or ether thereof with an unsaturated carboxylic acid. *Kinoshita* discloses that these polyether ester monomers are useful in preparing cement dispersants which are water soluble.

In ¶s [0009] and [0010], *Kinoshita* discloses that the polyethers of his polyetherester monomers are polyoxyethylene glycols or polyoxyethylenepolyoxypropylene glycols, i.e. copolyethers prepared by copolymerizing both ethylene oxide and propylene oxide. The EO/PO copolymers may be random ("heteric") or block copolymers, but in any case must contain a large amount of oxyethylene moieties - otherwise the products would not be soluble. *Kinoshita* does not disclose, nor does he teach or suggest the use of polyoxypropylene or polyoxybutylene homopolyethers, nor would he, since these latter polyethers are generally water insoluble, waxy or oily products, while polyoxyethylene glycols, even of very high molecular weight, are water soluble.

The present invention requires both polyoxyethylene and polyoxypropylene or polyoxybutylene moieties. *Kinoshita* discloses no such polymers, nor does he suggest them. The Office states that *Kinoshita's* EO/PO block polyether "fulfills the limitations of the instantly claimed component C and D." This is incorrect, however.

In Applicants' polymers, the monomers c) and d) are "separate" monomers - one is a polyoxyethylene monomer and one is a polyoxypropylene or polyoxybutylene¹ monomer. As a result of the use of these separate monomers, Applicants' polymers are structured with a main chain to which separate, pendant polyoxyethylene and polyoxypropylene groups are attached, resulting in a comb-like polymer with a random distribution of polyoxyethylene and polyoxypropylene chains. The polyoxyethylene side branches are hydrophilic, solubilizing groups, while the polyoxypropylene side branches are substantially hydrophobic groups which cannot exert a solubilizing effect in water.

By contrast, the polymers of *Kinoshita* contain only polyoxyethylene-containing pendant groups, a totally different polymer. If an EO/PO block copolyether monomer were used by *Kinoshita*, the polymer would still not be the same as Applicants, because rather than having hydrophilic and hydrophobic polyether groups pendant to the polymer backbone, *Kinoshita's*

¹For sake of brevity, Applicants will refer only to "polyoxypropylene" hereafter. The discussion should be considered to pertain to polyoxybutylene monomers as well.

polymer would have identical pendant "mixed polyether" groups along the backbone. There would be no random arrangement of polyoxyethylene and polyoxypropylene groups. Applicants have amended claim 16 to ensure that it is interpreted as pertaining only to homopolyoxyethylene glycols (monomer c)) and homo- or copolymer polyoxyalkylene glycols containing only oxypropylene and/or oxybutylene groups (monomer d)). Thus, monomers (d) cannot contain oxyethylene groups.

It is well known in the art that the properties of polyoxyethylene polyethers, polyoxypropylene polyethers, and polyoxyethylenepolyoxypropylene copolyethers are very different. Homopolyoxyethylene glycols are all water soluble, and their alkyl ethers are valuable surfactants in which the HLB (hydrophile/lipophile balance) can be readily adjusted. Polyoxypropylene glycols, on the other hand, are for the most part insoluble, and exhibit little or no surfactant activity. Polyoxyethylene/polyoxypropylene copolymers, on the other hand, are substantially water soluble, and have very powerful surfactant effects quite unlike homopolymeric polyoxyethylene polyethers. Random and block polyether surfactants prepared from ethylene oxide and propylene oxide have been available for about 50 years from BASF Corporation under the tradename PLURONIC® polyether surfactants. In these surfactants, the most commercially viable have been those with a polyoxyethylene block to provide water solubility and a polyoxypropylene block to provide a hydrophobe. Triblock products have been particularly successful. Reference may be had to the decades-old and well known treatise NONIONIC SURFACTANTS, Martin Schick, ed. and to Thomas H. Vaughn et al., "Nonionic Surfactants Derived from a New Hydrophobic Base," J. AM. OIL CHEM. SOC., Vol. 29, 6, pp. 240 - 243 (1951). One desirous of preparing a water soluble polymer, which is the aim of *Kinoshita*, would not be motivated to substitute a hydrophobic, polyoxypropylene monomer with little or no water solubility for a polyoxyethylene or polyoxyethylene/polyoxypropylene monomer, since both the latter are hydrophilic water solubilizing and surface-active groups, whereas polyoxypropylene groups have neither of these characteristics.²

²That the *Kinoshita* polymers and Applicants' polymers are different is also shown by the fact that *Kinoshita's* polymers are water soluble - that is his aim. Since they are not insoluble, dispersions cannot be prepared, and redispersible polymer powders also cannot be prepared, since their preparation requires a dispersed polymer phase and protective colloid, followed by spray

Thus, *Kinoshita* does not disclose the claimed copolymers, nor does he teach or suggest them. Withdrawal of the rejection of the claims under 35 U.S.C. § 103(a) over *Kinoshita* is respectfully solicited.

Claims 24 and 25 have been rejected under 35 U.S.C. § 103(a) as unpatentable over Weitzel et al. U.S. 6,127,283 ("*Weitzel*") in view of *Kinoshita*. Applicants respectfully traverse this rejection.

Weitzel teaches spray drying of vinyl ester/ethylene copolymer dispersions to produce redispersible polymer powders. Such redispersible polymer powders, when added to aqueous compositions, easily redisperse to form a dispersion having the same particle size and particle size distribution as the initial polymer dispersion prior to spray drying. This result is achieved, as is well known, by adding a substantial amount of a water soluble protective colloid to the dispersion prior to spray drying. The protective colloid forms a soluble, protective sheath around the polymer particle.

The most common protective colloid is polyvinyl alcohol, although many others are known. *Weitzel* chose a protective colloid which is water soluble, but contains a significant amount of water-insoluble (hydrophobic) monomers. Water solubility is achieved by the presence of large amounts of sulfonate salt-functional comonomers.

Claim 24 requires the claimed copolymers to be used as a dispersant, or "protective colloid". The position of the Office is that *Kinoshita* discloses Applicants' polymers, and it would be obvious to one skilled in the art to use this polymer as a spray assistant. This is incorrect, however, for two reasons.

First, as indicated earlier, *Kinoshita* does not disclose Applicants' copolymer, nor does he teach or suggest such a copolymer. Second, there is no evidence that the different polymer of *Kinoshita* would be useful as a protective colloid. The protective colloids of *Weitzel*

drying. Applicants' polymers, on the other hand, are prepared as dispersions. See all examples.

contain no pendant polyether groups of any kind. One skilled in the art could not predict whether a *Kinoshita* copolymer would be successful as a protective colloid in preparing redispersible polymer powders. Polyethers are oily or waxy "sticky" products, and incorporating them into a vinyl addition polymer might make them so tacky that they could not be used. There is no teaching or suggestion in *Kinoshita* that these polymers might have such a use, nor is there any suggestion in *Weitzel* that polyether-modified vinyl polymers might have such a use. There simply is nothing, in the general knowledge of the art as a whole, or the references, whether alone or in combination, which would direct the skilled artisan to use Applicants' copolymers, which are different from those of *Kinoshita*, or *Kinoshita's* products, as a protective colloid. Withdrawal of the rejection over *Weitzel* in view of *Kinoshita* is respectfully solicited.

Moreover, the polymers of *Weitzel*, even if one were somehow motivated to include unsaturated polyoxyalkylene monomers, would not result in the claimed polymers, since the *Weitzel* polymers require 20 - 80% of hydrophobic (water insoluble) monomers, while the present claims are limited to 10 weight percent of such monomers (monomer e)). *Weitzel* also requires hydrophilic, salt-forming monomers, whereas the polyoxyethylene homopolymers and copolymers of *Kinoshita* are water soluble, non-ionic monomers. These references cannot be combined, and if combined, do not teach or suggest the claimed invention. The rejection should be withdrawn for these additional reasons.

It is noted that KSR does not apply here. First, the Federal Circuit has held that KSR has little application to chemical cases, due to the unpredictability involved. Second, KSR involved a very simple mechanical invention where there were only a limited number of choices available. Here, there are hundreds if not thousands of potential monomers and monomer classes for use in preparing vinyl polymers. Applicants' polymers require four such classes. *Kinoshita* discloses only three. The number of additional monomers and monomer classes possible of investigation does not lead the skilled artisan to Applicants' invention. The Supreme Court never stated that "obvious to try" was an acceptable standard. What it did say was that "obvious to try" might apply when 1) there are only limited choices, 2) where the result is predictable, and 3) where there is no teaching away. Here, there are numerous choices and no predictability.

Applicants have also achieved a surprising and unexpected result, as indicated in Table 2 of page 17. Note the great similarity between the results of the subject invention powders (1 - 6) and the casein control (VI). The slump values are very similar, but the subject invention polymers had higher flexural strength and higher compressive strength. There is no way one skilled in the art could have predicted that Applicants' copolymers could be such an excellent substitute for casein for working properties, and yet provide even enhanced cured cement properties.

Also, on page 17 of the specification, a dispersant similar to those of *Kinoshita* is employed as comparative example V2. This polymer is a copolymer of methacrylic acid and methoxypolyoxyethylene glycol methacrylate, commercially available as Elotex FL51. This copolymer, having only pendant polyoxyethylene moieties, had much reduced slump as compared to the inventive copolymers, had greater loss of slump over time, and the cured cement products employing this dispersant had considerably less flexural tensile strength and compressive strength as compared to the inventive dispersants.

New claims 30 - 32 have been added. Claim 30 specifies that the dispersants are insoluble in water but soluble in aqueous alkali. See all the examples. Claim 31 requires comonomer d) to be an unsaturated compound of a polyoxypropylene homopolymer, whereas claim 32 requires the comonomer d) to be a polyoxybutylene homopolymer. *Kinoshita* discloses neither of these, nor would one be motivated to use these hydrophobic monomers in view of *Kinoshita*, as *Kinoshita* requires his polymers to be water soluble. One would not be motivated to employ monomers which would reduce water solubility.

Applicants submit that the claims are now in condition for Allowance, and respectfully request a Notice to that effect. If the Examiner believes that further discussion will advance the prosecution of the Application, the Examiner is highly encouraged to telephone Applicants' attorney at the number given below.

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Respectfully submitted,

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